



SEQUENCE LISTING

<110> Kirsch, Wolff  
Lennart, Anton  
Kelln, Wayne  
Kang, Dae-Kyung  
Levine, Rodney  
Rouault, Tracey

<120> IRON-REGULATING PROTEIN-2 (IRP-2) IS  
DIAGNOSTIC FOR NEURODEGENERATIVE DISEASE

<130> LOMAU.140A

<140> 09/924,396

<141> 2001-08-06

<150> 60/222,863

<151> 2000-08-04

<160> 20

<170> FastSEQ for Windows Version 4.0

<210> 1

<211> 189

<212> DNA

<213> Artificial Sequence

<220>

<223> cloning oligonucleotide

<400> 1

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tgtgattctg gagaactagg ccgaaactca ggaacatttt cttcgcatat tgagaatata 180  
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<210> 2

<211> 63

<212> PRT

<213> Artificial Sequence

<220>

<223> peptide for antibody production

<400> 2

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1 5 10 15  
Gly Lys Leu Ser Pro Leu Lys Val Gln Pro Lys Lys Leu Pro Cys Arg  
20 25 30  
Gly Gln Thr Thr Cys Arg Gly Ser Cys Asp Ser Gly Glu Leu Gly Arg  
35 40 45  
Asn Ser Gly Thr Phe Ser Ser Gln Ile Glu Asn Thr Pro Ile Leu  
50 55 60

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ccacttaaag tgcagcctaa gaagcttccc gccagaggcc agactacctg ccgaggatct 120  
tgtgattctg gagaactagg ccgaaactca ggaacatttt cttcgcatat tgagaataca 180  
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<210> 4  
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<400> 4  
Ala Ile Gln Asn Ala Pro Asn Pro Gly Gly Gly Asp Leu Gln Lys Ala  
1 5 10 15  
Gly Lys Leu Ser Pro Leu Lys Val Gln Pro Lys Lys Leu Pro Cys Arg  
20 25 30  
Gly Gln Thr Thr Cys Arg Gly Ser Cys Asp Ser Gly Glu Leu Gly Arg  
35 40 45  
Asn Ser Gly Thr Phe Ser Ser Gln Ile Glu Asn Thr Pro Ile Leu  
50 55 60

<210> 5  
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<220>  
<223> cloning oligonucleotide

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ccacttaaag tgcagcctaa gaagcttccc tgcagaggcc agactaccgc ccgaggatct 120  
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cccatcctg 189

<210> 6  
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<212> PRT  
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<220>  
<223> peptide for antibody production

<400> 6

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ala | Ile | Gln | Asn | Ala | Pro | Asn | Pro | Gly | Gly | Gly | Asp | Leu | Gln | Lys | Ala |
| 1   |     |     |     | 5   |     |     |     | 10  |     |     |     |     |     | 15  |     |
| Gly | Lys | Leu | Ser | Pro | Leu | Lys | Val | Gln | Pro | Lys | Lys | Leu | Pro | Cys | Arg |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |
| Gly | Gln | Thr | Thr | Ala | Arg | Gly | Ser | Cys | Asp | Ser | Gly | Glu | Leu | Gly | Arg |
|     |     | 35  |     |     |     | 40  |     |     |     |     | 45  |     |     |     |     |
| Asn | Ser | Gly | Thr | Phe | Ser | Ser | Gln | Ile | Glu | Asn | Thr | Pro | Ile | Leu |     |
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<223> cloning oligonucleotide

<400> 7

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| ccacttaaag | tcgagcctaa | gaagcttccc | tcgagaggcc | agactacctg | ccgaggatct | 120 |
| gctgattctg | gagaactagg | ccgaaactca | ggaacatttt | cttcgcagat | tgagaatata | 180 |
| cccatcctg  |            |            |            |            |            | 189 |

<210> 8

<211> 63

<212> PRT

<213> Artificial Sequence

<220>

<223> peptide for antibody production

<400> 8

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ala | Ile | Gln | Asn | Ala | Pro | Asn | Pro | Gly | Gly | Gly | Asp | Leu | Gln | Lys | Ala |
| 1   |     |     |     | 5   |     |     |     | 10  |     |     |     |     |     | 15  |     |
| Gly | Lys | Leu | Ser | Pro | Leu | Lys | Val | Gln | Pro | Lys | Lys | Leu | Pro | Cys | Arg |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |
| Gly | Gln | Thr | Thr | Cys | Arg | Gly | Ser | Ala | Asp | Ser | Gly | Glu | Leu | Gly | Arg |
|     |     | 35  |     |     |     | 40  |     |     |     |     | 45  |     |     |     |     |
| Asn | Ser | Gly | Thr | Phe | Ser | Ser | Gln | Ile | Glu | Asn | Thr | Pro | Ile | Leu |     |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |

<210> 9

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<212> DNA

<213> Artificial Sequence

<220>

<223> cloning oligonucleotide

<400> 9

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| ccacttaaag | tcgagcctaa | gaagcttccc | gccagaggcc | agactaccgc | ccgaggatct | 120 |
| tgtgattctg | gagaactagg | ccgaaactca | ggaacatttt | cttcgcagat | tgagaatata | 180 |
| cccatcctg  |            |            |            |            |            | 189 |

<210> 10  
<211> 63  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> peptide for antibody production

<400> 10  
Ala Ile Gln Asn Ala Pro Asn Pro Gly Gly Gly Asp Leu Gln Lys Ala  
1 5 10 15  
Gly Lys Leu Ser Pro Leu Lys Val Gln Pro Lys Lys Leu Pro Ala Arg  
20 25 30  
Gly Gln Thr Thr Ala Arg Gly Ser Cys Asp Ser Gly Glu Leu Gly Arg  
35 40 45  
Asn Ser Gly Thr Phe Ser Ser Gln Ile Glu Asn Thr Pro Ile Leu  
50 55 60

<210> 11  
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<212> DNA  
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<220>  
<223> cloning oligonucleotide

<400> 11  
gcaatacaga atgcaccaaa tcctggaggt ggtgacctgc agaaagcagg aaagctctct 60  
ccacttaaag tgcagcctaa gaagcttccc tgcagaggcc agactaccgc ccgaggatct 120  
gctgattctg gagaactagg ccgaaactca ggaacatttt cttcgcatat tgagaatata 180  
cccatcctg 189

<210> 12  
<211> 63  
<212> PRT  
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<220>  
<223> peptide for antibody production

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Ala Ile Gln Asn Ala Pro Asn Pro Gly Gly Gly Asp Leu Gln Lys Ala  
1 5 10 15  
Gly Lys Leu Ser Pro Leu Lys Val Gln Pro Lys Lys Leu Pro Cys Arg  
20 25 30  
Gly Gln Thr Thr Ala Arg Gly Ser Ala Asp Ser Gly Glu Leu Gly Arg  
35 40 45  
Asn Ser Gly Thr Phe Ser Ser Gln Ile Glu Asn Thr Pro Ile Leu  
50 55 60

<210> 13  
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<220>

<223> cloning oligonucleotide

<400> 13

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ccacttaaag tgcagcctaa gaagcttccc gccagaggcc agactacctg ccgaggatct 120
gctgattctg gagaactagg ccgaaactca ggaacatttt cttcgcatat tgagaataca 180
cccatcctg                                     189
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<210> 14

<211> 63

<212> PRT

<213> Artificial Sequence

<220>

<223> peptide for antibody production

<400> 14

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 1             5             10             15
Gly Lys Leu Ser Pro Leu Lys Val Gln Pro Lys Lys Leu Pro Ala Arg
          20          25          30
Gly Gln Thr Thr Cys Arg Gly Ser Ala Asp Ser Gly Glu Leu Gly Arg
          35          40          45
Asn Ser Gly Thr Phe Ser Ser Gln Ile Glu Asn Thr Pro Ile Leu
 50             55             60
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<210> 15

<211> 189

<212> DNA

<213> Artificial Sequence

<220>

<223> cloning oligonucleotide

<400> 15

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ccacttaaag tgcagcctaa gaagcttccc gccagaggcc agactaccgc ccgaggatct 120
gctgattctg gagaactagg ccgaaactca ggaacatttt cttcgcatat tgagaataca 180
cccatcctg                                     189
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<210> 16

<211> 63

<212> PRT

<213> Artificial Sequence

<220>

<223> peptide for antibody production

<400> 16

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Ala Ile Gln Asn Ala Pro Asn Pro Gly Gly Gly Asp Leu Gln Lys Ala
 1             5             10             15
Gly Lys Leu Ser Pro Leu Lys Val Gln Pro Lys Lys Leu Pro Ala Arg
          20          25          30
Gly Gln Thr Thr Ala Arg Gly Ser Ala Asp Ser Gly Glu Leu Gly Arg
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|   |    |    |
|---|----|----|
| 35  | 40 | 45 |
| Asn Ser Gly Thr Phe Ser Ser Gln Ile Glu Asn Thr Pro Ile Leu |    |    |
| 50  | 55 | 60 |

<210> 17  
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 <212> DNA  
 <213> Homo Sapiens

<400> 17

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| ggcaccaagt  | atgatgttct  | gccttactca  | atacgggtct  | tggtggaagc  | tgctgtacga  | 120  |
| aattgtgatg  | gctttttaat  | gaagaaggaa  | gatgttatga  | acatttttaga | ctggaaaacc  | 180  |
| aaacaaagca  | atgttgaagt  | gccctttttc  | cctgcccgtg  | ttcttcttca  | agattttact  | 240  |
| ggaataccag  | caatggtgga  | ttttgctgct  | atgagggagg  | cagtgaaaac  | tcttggaggt  | 300  |
| gatacctgaga | aagtccatcc  | tgcttgtccg  | acagatctta  | cagttgacca  | ttctttacaa  | 360  |
| attgacttca  | gtaaatgtgc  | aatacagaat  | gcaccaaadc  | ctggaggtgg  | tgacctgcag  | 420  |
| aaagcaggaa  | agctctctcc  | acttaaagtg  | cagcctaaga  | agcttcctcg  | cagaggccag  | 480  |
| actacctgcc  | gaggatcttg  | tgattctgga  | gaactaggcc  | gaaactcagg  | aacattttct  | 540  |
| tcgcagattg  | agaatacacc  | catcctgtgt  | ccttttcatt  | tgcaaccagt  | gcctgaacct  | 600  |
| gaaacagtgt  | taaaaaatca  | agaagtagaa  | ttcggcagaa  | atcgagagag  | gcttcagttt  | 660  |
| tttaagtggg  | gttcaagagt  | tttaaagaat  | gtggcagtga  | tccctcctgg  | aactggaatg  | 720  |
| gctcatcaaa  | taaacttaga  | atatttgtca  | agagtggttt  | ttgaagaaaa  | agacctcctc  | 780  |
| ttcccagaca  | gtgtagtcgg  | cacagattca  | cacataacga  | tggtgaatgg  | tttagggatt  | 840  |
| ctgggggtggg | gggttgaggg  | cattgaaaca  | gaagcagtta  | tgcttgggtc  | gccagtttct  | 900  |
| cttactttac  | cagaggtggg  | tggtgtgag   | ttaactgggt  | catcaaacc   | ttttgttaca  | 960  |
| tccatagatg  | ttgttcttgg  | tattacaaag  | cacctcaggc  | aagtaggagt  | ggctggaaag  | 1020 |
| tttgttgagt  | tttttggaag  | tgaggtttca  | caattatcta  | tagttgatcg  | aactacaata  | 1080 |
| gcaaacatgt  | gtccggaata  | tggtgctatc  | ctcagctttt  | tccctgttga  | caatgtgaca  | 1140 |
| ttaaaacatt  | tagaacatac  | aggttttagc  | aaagccaaac  | tcgaatcaat  | ggaaacatac  | 1200 |
| cttaaagctg  | tgaaattggt  | tcgaaatgac  | cagaattctt  | caggagaacc  | tgaatactcc  | 1260 |
| caggtgatcc  | agattaatct  | gaattcaata  | gttccatctg  | ttagtgggtc  | aaaaagacct  | 1320 |
| cgggatagag  | ttgctgtgac  | agatatgaaa  | agcgatttcc  | aggcttgctt  | aaatgaaaag  | 1380 |
| gttggtattta | aaggcttcca  | aattgcagct  | gaaaaacaaa  | aggatattgt  | ctccattcat  | 1440 |
| tatgaaggaa  | gtgaatataa  | gctgtctcat  | ggatcagtg   | tcattgctgc  | agttatcagt  | 1500 |
| tgtaccaata  | attgcaatcc  | atctgtcatg  | cttgctgcag  | gtcttttggc  | taaaaaggct  | 1560 |
| gttgaagctg  | gtctgctgtg  | taaaccttat  | ataagaacaa  | gtttatctcc  | aggcagtg    | 1620 |
| atggttacac  | attacctcag  | ttcaagtggg  | gtattaccat  | atctaagtaa  | gcttggattt  | 1680 |
| gaaatcggtg  | gctatggatg  | ttcaacttgt  | gtgggaaata  | cagcaccctt  | atcagacgca  | 1740 |
| gttttaaatg  | cagtaaaaca  | gggtgatttg  | gttacctgtg  | gtaattttat  | ctggaaaaaa  | 1800 |
| aattttgaag  | gtcgtctttg  | tgattgtgtt  | cgtgccatt   | atcttgcctc  | tccaccctta  | 1860 |
| gtggtagctt  | atgccatagc  | aggcacagt   | aatatagatt  | tccagacaga  | accttttaggt | 1920 |
| actgacccca  | ccggcaagaa  | catttacctg  | catgatattt  | ggcctagtcg  | agaagaagtt  | 1980 |
| catcgagtag  | aggaagaaca  | tggtatacta  | tccatgttta  | aagcattaaa  | agataaaata  | 2040 |
| gaaatgggga  | ataaacgggtg | gaattcctta  | gaagcaccgg  | attcagtttt  | gtttccatgg  | 2100 |
| gacttaaagt  | ctacttatat  | cagatgccct  | tcattttttg  | ataaacctac  | caaagagcca  | 2160 |
| attgcactcc  | aggctattga  | aaatgcccac  | gtcttattat  | atttgggaga  | ctctgtcaca  | 2220 |
| acagatcata  | tatcacctgc  | aggaagtatc  | gctaggaata  | gtgctgccgc  | taagtatttg  | 2280 |
| acaaacagag  | gccttaccce  | tcgtgaattc  | aactcttacg  | gagctcgaag  | aggtaatgat  | 2340 |
| gctgtaatga  | caagaggcac  | ttttgcaaat  | atcaagcttt  | ttaataagtt  | tattggaaaa  | 2400 |
| ccagctccta  | aaacaattca  | ttttccatca  | ggacagacgc  | tagatgtatt  | tgaggctgca  | 2460 |
| gagctgtacc  | agaaagaagg  | tatcccactg  | attatttttag | caggaaagaa  | atatggttca  | 2520 |
| ggaaactcca  | gagactgggc  | tgccaaagga  | ccgtattttac | tgggtgtgaa  | agctgttttg  | 2580 |
| gccgaaagtt  | atgaaaaaat  | acacaaagat  | catttgattg  | gaattggcat  | agctccactt  | 2640 |
| cagttccttc  | caggagaaaa  | tgacagattcc | ttgggcctct  | ccggtagaga  | aacattttct  | 2700 |
| ttaacatttc  | ctgaagaact  | gtctcctgga  | attacattga  | atatacagac  | aagcactgga  | 2760 |

aaagtattca gcgtgattgc ttcgtttgaa gatgatgtgg aaataacatt atacaaacat 2820  
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<210> 18

<211> 952

<212> PRT

<213> Homo Sapiens

<400> 18

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| Tyr | Leu | Ile | Glu | Thr | Leu | Asn | Asp | Ser | Ser | His | Lys | Lys | Phe | Phe | Asp |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |
| Val | Ser | Lys | Leu | Gly | Thr | Lys | Tyr | Asp | Val | Leu | Pro | Tyr | Ser | Ile | Arg |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |
| Val | Leu | Leu | Glu | Ala | Ala | Val | Arg | Asn | Cys | Asp | Gly | Phe | Leu | Met | Lys |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |
| Lys | Glu | Asp | Val | Met | Asn | Ile | Leu | Asp | Trp | Lys | Thr | Lys | Gln | Ser | Asn |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |
| Val | Glu | Val | Pro | Phe | Phe | Pro | Ala | Arg | Val | Leu | Leu | Gln | Asp | Phe | Thr |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |
| Gly | Ile | Pro | Ala | Met | Val | Asp | Phe | Ala | Ala | Met | Arg | Glu | Ala | Val | Lys |
|     |     |     |     | 85  |     |     |     | 90  |     |     |     |     |     | 95  |     |
| Thr | Leu | Gly | Gly | Asp | Pro | Glu | Lys | Val | His | Pro | Ala | Cys | Pro | Thr | Asp |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |
| Leu | Thr | Val | Asp | His | Ser | Leu | Gln | Ile | Asp | Phe | Ser | Lys | Cys | Ala | Ile |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |
| Gln | Asn | Ala | Pro | Asn | Pro | Gly | Gly | Gly | Asp | Leu | Gln | Lys | Ala | Gly | Lys |
|     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |
| Leu | Ser | Pro | Leu | Lys | Val | Gln | Pro | Lys | Lys | Leu | Pro | Cys | Arg | Gly | Gln |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |
| Thr | Thr | Cys | Arg | Gly | Ser | Cys | Asp | Ser | Gly | Glu | Leu | Gly | Arg | Asn | Ser |
|     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |
| Gly | Thr | Phe | Ser | Ser | Gln | Ile | Glu | Asn | Thr | Pro | Ile | Leu | Cys | Pro | Phe |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |
| His | Leu | Gln | Pro | Val | Pro | Glu | Pro | Glu | Thr | Val | Leu | Lys | Asn | Gln | Glu |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |
| Val | Glu | Phe | Gly | Arg | Asn | Arg | Glu | Arg | Leu | Gln | Phe | Phe | Lys | Trp | Ser |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |
| Ser | Arg | Val | Leu | Lys | Asn | Val | Ala | Val | Ile | Pro | Pro | Gly | Thr | Gly | Met |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |
| Ala | His | Gln | Ile | Asn | Leu | Glu | Tyr | Leu | Ser | Arg | Val | Val | Phe | Glu | Glu |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |
| Lys | Asp | Leu | Leu | Phe | Pro | Asp | Ser | Val | Val | Gly | Thr | Asp | Ser | His | Ile |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |
| Thr | Met | Val | Asn | Gly | Leu | Gly | Ile | Leu | Gly | Trp | Gly | Val | Gly | Gly | Ile |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |
| Glu | Thr | Glu | Ala | Val | Met | Leu | Gly | Leu | Pro | Val | Ser | Leu | Thr | Leu | Pro |
|     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |
| Glu | Val | Val | Gly | Cys | Glu | Leu | Thr | Gly | Ser | Ser | Asn | Pro | Phe | Val | Thr |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |
| Ser | Ile | Asp | Val | Val | Leu | Gly | Ile | Thr | Lys | His | Leu | Arg | Gln | Val | Gly |
|     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |
| Val | Ala | Gly | Lys | Phe | Val | Glu | Phe | Phe | Gly | Ser | Gly | Val | Ser | Gln | Leu |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |
| Ser | Ile | Val | Asp | Arg | Thr | Thr | Ile | Ala | Asn | Met | Cys | Pro | Glu | Tyr | Gly |
|     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |
| Ala | Ile | Leu | Ser | Phe | Phe | Pro | Val | Asp | Asn | Val | Thr | Leu | Lys | His | Leu |
|     | 370 |     |     |     |     | 375 |     |     |     |     |     | 380 |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Glu | His | Thr | Gly | Phe | Ser | Lys | Ala | Lys | Leu | Glu | Ser | Met | Glu | Thr | Tyr | 385 | 390 | 395 | 400 |
| Leu | Lys | Ala | Val | Lys | Leu | Phe | Arg | Asn | Asp | Gln | Asn | Ser | Ser | Gly | Glu | 405 | 410 | 415 |     |
| Pro | Glu | Tyr | Ser | Gln | Val | Ile | Gln | Ile | Asn | Leu | Asn | Ser | Ile | Val | Pro | 420 | 425 | 430 |     |
| Ser | Val | Ser | Gly | Pro | Lys | Arg | Pro | Arg | Asp | Arg | Val | Ala | Val | Thr | Asp | 435 | 440 | 445 |     |
| Met | Lys | Ser | Asp | Phe | Gln | Ala | Cys | Leu | Asn | Glu | Lys | Val | Gly | Phe | Lys | 450 | 455 | 460 |     |
| Gly | Phe | Gln | Ile | Ala | Ala | Glu | Lys | Gln | Lys | Asp | Ile | Val | Ser | Ile | His | 465 | 470 | 475 | 480 |
| Tyr | Glu | Gly | Ser | Glu | Tyr | Lys | Leu | Ser | His | Gly | Ser | Val | Val | Ile | Ala | 485 | 490 | 495 |     |
| Ala | Val | Ile | Ser | Cys | Thr | Asn | Asn | Cys | Asn | Pro | Ser | Val | Met | Leu | Ala | 500 | 505 | 510 |     |
| Ala | Gly | Leu | Leu | Ala | Lys | Lys | Ala | Val | Glu | Ala | Gly | Leu | Arg | Val | Lys | 515 | 520 | 525 |     |
| Pro | Tyr | Ile | Arg | Thr | Ser | Leu | Ser | Pro | Gly | Ser | Gly | Met | Val | Thr | His | 530 | 535 | 540 |     |
| Tyr | Leu | Ser | Ser | Ser | Gly | Val | Leu | Pro | Tyr | Leu | Ser | Lys | Leu | Gly | Phe | 545 | 550 | 555 | 560 |
| Glu | Ile | Val | Gly | Tyr | Gly | Cys | Ser | Thr | Cys | Val | Gly | Asn | Thr | Ala | Pro | 565 | 570 | 575 |     |
| Leu | Ser | Asp | Ala | Val | Leu | Asn | Ala | Val | Lys | Gln | Gly | Asp | Leu | Val | Thr | 580 | 585 | 590 |     |
| Cys | Gly | Asn | Phe | Ile | Trp | Lys | Lys | Asn | Phe | Glu | Gly | Arg | Leu | Cys | Asp | 595 | 600 | 605 |     |
| Cys | Val | Arg | Ala | Asn | Tyr | Leu | Ala | Ser | Pro | Pro | Leu | Val | Val | Ala | Tyr | 610 | 615 | 620 |     |
| Ala | Ile | Ala | Gly | Thr | Val | Asn | Ile | Asp | Phe | Gln | Thr | Glu | Pro | Leu | Gly | 625 | 630 | 635 | 640 |
| Thr | Asp | Pro | Thr | Gly | Lys | Asn | Ile | Tyr | Leu | His | Asp | Ile | Trp | Pro | Ser | 645 | 650 | 655 |     |
| Arg | Glu | Glu | Val | His | Arg | Val | Glu | Glu | Glu | His | Val | Ile | Leu | Ser | Met | 660 | 665 | 670 |     |
| Phe | Lys | Ala | Leu | Lys | Asp | Lys | Ile | Glu | Met | Gly | Asn | Lys | Arg | Trp | Asn | 675 | 680 | 685 |     |
| Ser | Leu | Glu | Ala | Pro | Asp | Ser | Val | Leu | Phe | Pro | Trp | Asp | Leu | Lys | Ser | 690 | 695 | 700 |     |
| Thr | Tyr | Ile | Arg | Cys | Pro | Ser | Phe | Phe | Asp | Lys | Leu | Thr | Lys | Glu | Pro | 705 | 710 | 715 | 720 |
| Ile | Ala | Leu | Gln | Ala | Ile | Glu | Asn | Ala | His | Val | Leu | Leu | Tyr | Leu | Gly | 725 | 730 | 735 |     |
| Asp | Ser | Val | Thr | Thr | Asp | His | Ile | Ser | Pro | Ala | Gly | Ser | Ile | Ala | Arg | 740 | 745 | 750 |     |
| Asn | Ser | Ala | Ala | Ala | Lys | Tyr | Leu | Thr | Asn | Arg | Gly | Leu | Thr | Pro | Arg | 755 | 760 | 765 |     |
| Glu | Phe | Asn | Ser | Tyr | Gly | Ala | Arg | Arg | Gly | Asn | Asp | Ala | Val | Met | Thr | 770 | 775 | 780 |     |
| Arg | Gly | Thr | Phe | Ala | Asn | Ile | Lys | Leu | Phe | Asn | Lys | Phe | Ile | Gly | Lys | 785 | 790 | 795 | 800 |
| Pro | Ala | Pro | Lys | Thr | Ile | His | Phe | Pro | Ser | Gly | Gln | Thr | Leu | Asp | Val | 805 | 810 | 815 |     |
| Phe | Glu | Ala | Ala | Glu | Leu | Tyr | Gln | Lys | Glu | Gly | Ile | Pro | Leu | Ile | Ile | 820 | 825 | 830 |     |
| Leu | Ala | Gly | Lys | Lys | Tyr | Gly | Ser | Gly | Asn | Ser | Arg | Asp | Trp | Ala | Ala |     |     |     |     |



|   |     |     |     |     |
|---|-----|-----|-----|-----|
| 835   |     | 840 |     | 845 |
| Lys Gly Pro Tyr Leu Leu Gly Val Lys Ala Val Leu Ala Glu Ser Tyr |     |     |     |     |
| 850   |     | 855 |     | 860 |
| Glu Lys Ile His Lys Asp His Leu Ile Gly Ile Gly Ile Ala Pro Leu |     |     |     |     |
| 865   |     | 870 |     | 875 |
| Gln Phe Leu Pro Gly Glu Asn Ala Asp Ser Leu Gly Leu Ser Gly Arg |     |     |     |     |
|   | 885 |     | 890 | 895 |
| Glu Thr Phe Ser Leu Thr Phe Pro Glu Glu Leu Ser Pro Gly Ile Thr |     |     |     |     |
|   | 900 |     | 905 | 910 |
| Leu Asn Ile Gln Thr Ser Thr Gly Lys Val Phe Ser Val Ile Ala Ser |     |     |     |     |
|   | 915 |     | 920 | 925 |
| Phe Glu Asp Asp Val Glu Ile Thr Leu Tyr Lys His Gly Gly Leu Leu |     |     |     |     |
|   | 930 |     | 935 | 940 |
| Asn Phe Val Ala Arg Lys Phe Ser                                 |     |     |     |     |
| 945   |     | 950 |     |     |

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 <212> DNA  
 <213> Rattus Norvegicus

<400> 19

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| taaatggcag  | ttcacagaag  | aagttcttca  | atgtacctaa | acttgagggc  | accaagtatg | 120  |
| atattctgcc  | ttactcaata  | cgggtcctat  | tggaagctgc | tgtacgaaat  | tgtgatggat | 180  |
| ttttaatgaa  | aaaggaagat  | gttataaata  | ttttggactg | gaaaaccaa   | caaagcaatg | 240  |
| ttgaagtgcc  | ctttttcccc  | gcccgtgttg  | ttcttcaaga | tttactgga   | ataccggcaa | 300  |
| tggtggatgt  | tgctgctatg  | agggaggcaa  | tgaaaactct | tgagggtgat  | cctaagaaag | 360  |
| tccacctgc   | ctgtccaaca  | gatctcacag  | ttgaccactc | tttacagatt  | gacttcagta | 420  |
| aatgtgcaat  | acagaatgca  | ccaaatcctg  | gaggtggtga | cctacagaaa  | gcaggaaagc | 480  |
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| atacgctgt   | cctgtgtccc  | tttcatttgc  | aaccagtgc  | tgaacctgag  | acggtgttaa | 660  |
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<211> 963

<212> PRT

<213> Rattus Norvegicus

<400> 20

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Gly Thr Lys Tyr Asp Ile Leu Pro Tyr Ser Ile Arg Val Leu Leu Glu
             35             40             45
Ala Ala Val Arg Asn Cys Asp Gly Phe Leu Met Lys Lys Glu Asp Val
             50             55             60
Ile Asn Ile Leu Asp Trp Lys Thr Lys Gln Ser Asn Val Glu Val Pro
65             70             75             80
Phe Phe Pro Ala Arg Val Val Leu Gln Asp Phe Thr Gly Ile Pro Ala
             85             90             95
Met Val Asp Phe Ala Ala Met Arg Glu Ala Met Lys Thr Leu Gly Gly
             100            105            110
Asp Pro Lys Lys Val His Pro Ala Cys Pro Thr Asp Leu Thr Val Asp
             115            120            125
His Ser Leu Gln Ile Asp Phe Ser Lys Cys Ala Ile Gln Asn Ala Pro
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Asn Pro Gly Gly Gly Asp Leu Gln Lys Ala Gly Lys Leu Ser Pro Leu
145            150            155            160
Lys Val Gln Pro Lys Lys Leu Pro Cys Arg Gly Gln Thr Thr Cys Arg

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|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|
|     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |  |  |
| Gly | Ser | Cys | Asp | Ser | Gly | Glu | Leu | Ser | Arg | Asn | Ser | Gly | Thr | Phe | Ser |  |  |
|     |     |     | 180 |     |     |     |     |     | 185 |     |     |     |     | 190 |     |  |  |
| Ser | Gln | Ile | Glu | Asn | Thr | Pro | Val | Leu | Cys | Pro | Phe | His | Leu | Gln | Pro |  |  |
|     |     | 195 |     |     |     |     |     | 200 |     |     |     | 205 |     |     |     |  |  |
| Val | Pro | Glu | Pro | Glu | Thr | Val | Leu | Lys | Asn | Gln | Glu | Val | Glu | Phe | Gly |  |  |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |  |  |
| Arg | Asn | Arg | Glu | Arg | Leu | Gln | Phe | Phe | Lys | Trp | Ser | Ser | Gly | Ala | Phe |  |  |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |  |  |
| Lys | Asn | Val | Ala | Val | Ile | Pro | Pro | Gly | Thr | Gly | Met | Ala | His | Gln | Val |  |  |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |  |  |
| Asn | Leu | Glu | His | Leu | Ser | Arg | Val | Val | Phe | Glu | Glu | Ala | Asp | Leu | Leu |  |  |
|     |     |     | 260 |     |     |     |     |     | 265 |     |     |     | 270 |     |     |  |  |
| Phe | Pro | Asp | Ser | Val | Ile | Gly | Thr | Asp | Ser | His | Ile | Thr | Met | Val | Asn |  |  |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |  |  |
| Gly | Leu | Gly | Ile | Leu | Gly | Trp | Gly | Val | Gly | Gly | Ile | Glu | Thr | Glu | Ala |  |  |
|     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |  |  |
| Val | Met | Leu | Gly | Leu | Pro | Val | Thr | Leu | Thr | Leu | Pro | Glu | Val | Val | Gly |  |  |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |  |  |
| Cys | Glu | Leu | Thr | Gly | Ser | Ser | Asn | Ala | Phe | Val | Thr | Ser | Ile | Asp | Ile |  |  |
|     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |  |  |
| Val | Leu | Gly | Ile | Thr | Lys | His | Leu | Arg | Gln | Val | Gly | Val | Ala | Gly | Lys |  |  |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |  |  |
| Phe | Val | Glu | Phe | Phe | Gly | Ser | Gly | Val | Ser | Gln | Leu | Ser | Ile | Val | Asp |  |  |
|     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |  |  |
| Arg | Thr | Thr | Ile | Ala | Asn | Met | Cys | Pro | Glu | Tyr | Gly | Ala | Ile | Leu | Ser |  |  |
|     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |  |  |
| Phe | Phe | Pro | Val | Asp | Asn | Val | Thr | Leu | Arg | His | Leu | Glu | His | Thr | Gly |  |  |
| 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |  |  |
| Phe | Asp | Lys | Thr | Lys | Leu | Glu | Ser | Met | Glu | Glu | Tyr | Leu | Lys | Ala | Val |  |  |
|     |     |     |     | 405 |     |     |     |     | 410 |     |     |     |     | 415 |     |  |  |
| Lys | Leu | Phe | Arg | Asn | Asp | Glu | Asn | Ser | Glu | Pro | Glu | Tyr | Ser | Gln |     |  |  |
|     |     |     | 420 |     |     |     |     | 425 |     |     |     | 430 |     |     |     |  |  |
| Val | Ile | Gln | Ile | Asn | Leu | Asn | Ser | Ile | Val | Ala | Ser | Val | Ser | Gly | Pro |  |  |
|     |     | 435 |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |  |  |
| Lys | Arg | Pro | Gln | Asp | Arg | Val | Ala | Val | Thr | Asp | Met | Lys | Ser | Asp | Phe |  |  |
|     | 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |  |  |
| Gln | Ala | Cys | Leu | Asn | Glu | Lys | Val | Gly | Phe | Lys | Gly | Phe | Gln | Val | Ala |  |  |
| 465 |     |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |  |  |
| Ala | Glu | Lys | Gln | Ser | Asp | Thr | Val | Ser | Val | Arg | Tyr | Asp | Gly | Ser | Glu |  |  |
|     |     |     |     | 485 |     |     |     |     | 490 |     |     |     | 495 |     |     |  |  |
| Tyr | Lys | Leu | Ser | His | Gly | Ser | Val | Val | Ile | Ala | Ala | Val | Ile | Ser | Cys |  |  |
|     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |  |  |
| Thr | Asn | Asn | Cys | Asn | Pro | Ser | Val | Met | Leu | Ala | Ala | Gly | Leu | Leu | Ala |  |  |
|     |     | 515 |     |     |     |     | 520 |     |     |     |     | 525 |     |     |     |  |  |
| Lys | Lys | Ala | Val | Glu | Thr | Gly | Leu | Arg | Val | Lys | Pro | Tyr | Ile | Arg | Thr |  |  |
|     | 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |  |  |
| Ser | Leu | Ser | Pro | Gly | Ser | Gly | Met | Val | Thr | His | Tyr | Leu | Ser | Ser | Ser |  |  |
| 545 |     |     |     |     | 550 |     |     |     |     | 555 |     |     |     |     | 560 |  |  |
| Gly | Val | Leu | Pro | Tyr | Leu | Ser | Lys | Leu | Gly | Phe | Glu | Ile | Val | Gly | Tyr |  |  |
|     |     |     |     | 565 |     |     |     |     | 570 |     |     |     |     | 575 |     |  |  |
| Gly | Cys | Ser | Thr | Cys | Val | Gly | Asn | Thr | Ala | Pro | Leu | Ser | Glu | Ala | Ile |  |  |
|     |     |     | 580 |     |     |     |     | 585 |     |     |     |     | 590 |     |     |  |  |
| Leu | Asn | Ala | Val | Lys | Gln | Gly | Asp | Leu | Ala | Thr | Cys | Gly | Val | Leu | Ser |  |  |
|     |     | 595 |     |     |     |     | 600 |     |     |     |     | 605 |     |     |     |  |  |
| Gly | Asn | Lys | Asn | Phe | Glu | Gly | Arg | Leu | Cys | Asp | Cys | Val | Arg | Ala | Asn |  |  |
|     | 610 |     |     |     |     |     | 615 |     |     |     |     | 620 |     |     |     |  |  |

[illegible]